

## **REMARKS**

Favorable reconsideration of this Application and the Office Action of August 2, 2006 are respectfully requested in view of the following remarks.

Claims 1 to 28 appear in this application. Claims 13 to 26 and 28 stand withdrawn from consideration under 37 CFR 1,142(b) as being directed to the non-elected invention.

Claims 4, 7 and 19 have been amended to correct typographical errors. Claims 2 and 14 have been amended to change the claimed percentages so that it is evident that the components do not add up to more than 100 %. Basis for the newly recited amounts is found in the specification at page 5, lines 16 and 30. None of these corrections are being made for patentability purposes and therefore do no incur prosecution history estoppel against the application of the doctrine of equivalents. Furthermore, these amendments do not raise new issues not previously presented by the prior claims and thus entry of this amendment after final is appropriate and proper.

The rejection of claims 1-4, 8-11 and 27 over Koito et al. (US 2003/0130147) under 35 U.S.C. 103, and claims 5-7 and 12 under 35 U.S.C. 103 over Koito et al. (US 2003/0130147) in view of Hara et al. (US 2002/0128164) are both respectfully traversed.

It is submitted that a proper and complete understanding of the **context** of the present invention vis-a vis the **context** of the prior art disclosure clearly shows the unobvious and patentable nature of the cleaning compositions of this invention. As microelectronic device fabrication has advanced certain new problems have developed. Due to issues with electrical performance and reliability in mass production, a variety of metal stacks are utilized for forming gate lines in FPD technology. Multiple metal layers such as Mo/AlNd/Mo, and especially double layers such as Mo/AlNd, AlNd/Ti, and AlNd/Cr are common for gate line metal stacks in current manufacturing of FPD technologies.

However, in stacks where the AlNd alloy is located beneath another metal, aluminum corrosion during the rinse step can be a critical problem for electrical performance. This corrosion is commonly known as overhang and can create voids that weaken the metal structure. Loss of aluminum to corrosion during the chemical cleaning or water rinse steps can also create notching in the metal lines, which is a most common defect at FPD technology. The composition of the cleaning solution and its behavior in water plays a key role in causing corrosion. A typical photoresist remover for FPD applications might include polar organic solvents blended with organic amines and other solvating agents. Amines have been shown to increase the effectiveness of photoresist removal in solvent blends. However, the water rinse following use of this type of cleaner or remover can create a strongly alkaline aqueous solution and that can lead to considerable loss of metal from the patterned lines. This necessitates an intermediate rinse between the cleaning/stripping step and the aqueous rinse. Such an intermediate rinse, typically with isopropyl alcohol, adds undesirable time, safety concerns, environmental consequences, and cost to the manufacturing process. Thus, there was a need for a **non-aqueous** alkaline-containing stripping and cleaning compositions for photoresists that enable one to completely remove both photoresist and etch and/or ash residue from the microelectronic substrate **yet not produce any significant metal (aluminum) corrosion during a subsequent aqueous rinse step**, especially for FPD microelectronic elements.

In contrast to this, the Koito et al. disclosure is directed to a completely different cleaning context. Koito et al. is addressing the problem of cleaning microelectronic devices characterized by copper and low dielectric films-see their background to their invention as described in the Section titled “Description of Related Art” and paragraphs [0015] to [0017] in their “Summary of the Invention” as well as the specific examples. This is quite different that the problem addressed by the present Applicants wherein they seek to solve the need for a **non-aqueous** cleaner/stripper/remover that would not produce such undesirable **aluminum** corrosion in a subsequent aqueous rinse and not require any intermediate rinse. That problem is addressed by the **non-aqueous** cleaning compositions of the present invention.

Applicant's claims are directed to a **non-aqueous** composition for cleaning microelectronic substrates that comprises:

the following components:

- (f) a nucleophilic amine,
- (g) a moderate to weak acid having a strength expressed as a "pKa" for the dissociation constant in aqueous solution of from about 1.2 to about 8,
- (h) a compound selected from the group consisting of an aliphatic alcohol, diol, polyol or glycol ether, and
- (i) an organic co-solvent,

and the weak acid component (b) is present in the composition in an amount such that the equivalent mole ratio of acid/amine is greater than .75 and the pH of the composition is from about pH 4.5 to 9.5.

The Office Action again admits, at page 5, second full paragraph) that the Koito et al. disclosure does "not teach, with sufficient specificity, a composition having the specific pH containing a nucleophilic amine, a moderate to weak acid, a glycol ether, a co-solvent, and the other requisite components of the composition in the specific proportions as recited by the instant claims."

Despite these glaring deficiencies in the reference disclosure, the PTO still rejects the claims over the Koito et al. disclosure on the unsupported basis that all these deficiencies in the Koito et al. reference disclosure is simply cured by "**the broad teachings of Koito**" would make the modification obvious to one skilled in the art. The PTO must read the disclosure of Koito et al **in context, not merely try to extract some broad contention therefrom merely to attempt to meet Applicant's invention.** Clearly, the PTO only makes this contention on the basis of having read Applicant's disclosure since absolutely nothing except the hindsight of Applicant's disclosure suggests all these criteria in common. However, the specific suggestion for all such parameters to be selected and met must come from the teaching in the prior art, without hindsight reference to Applicant's disclosure. Such hindsight reconstruction of the prior art is improper and

renders this rejection erroneous.

Moreover, the compositions of Koito et al. are intended for use in copper-containing substrates, whereas, is apparent from Applicant's disclosure, Applicant's compositions are intended for use against aluminum-containing substrates. These different substrates have differing strippability and non-corrosion requirements and, therefore, it is not possible to extrapolate the teaching of composition intended for copper (Koito et al.) to compositions intended for aluminum (Applicant's). The latest Office Action fails to address this previously submitted argument of Applicant.

In the previous May 3<sup>rd</sup> Office Action the PTO, in the RESPONSE TO ARGUMENTS section, dismisses the argument about strippability of aluminum substrates vs copper substrates on the basis that composition claims do not recite "for cleaning aluminum-containing substrates", and even if they did, that would be an intended use and not a patentable limitation. Applicant in response to that position of the PTO pointed out that the claims do not need to recite that limitation since they are composition claims. In the REONSE TO ARGUMENTS section of the August 2<sup>nd</sup> Office Action the PTO contends "...the examiner maintains that Koito et al suggest compositions containing the same components in the same amounts as recited by the instant claims and thus, the compositions taught by Koito et al meets all of the claim limitations and would have the same properties as the composition recited by the instant claims". This position flies in the face of the PTO admission, (at page 5, second full paragraph of the Action) that the Koito et al. disclosure does "not teach, with sufficient specificity, a composition having the specific pH containing a nucleophilic amine, a moderate to weak acid, a glycol ether, a co-solvent, and the other requisite components of the composition in the specific proportions as recited by the instant claims." The PTO would have made an anticipation rejection under 35 U.S.C. 102, not an obviousness rejection under 35 U.S.C. 103, if their responsive arguments were valid, which they are not.

The PTO also argues in the office Action that "Alternatively, even if the claims

recited 'for cleaning aluminum-containing substrates', this would be an intended use of the composition and not read as a patentable limitation." This position does not address the issue and completely misses the point and significance of Applicant's argument. While recitation of such a limitation in a composition claims is an intended use recitation and not a per se limitation on the composition, **the novel and unobvious properties of the claimed composition when employed for cleaning aluminum-containing substrates provides novel and unobvious properties to the claimed composition.** It is elementary that properties of compounds or composition must be considered in determining the patentability thereof. This has been elementary patent law since the case of *In re Papesch*, 315 F.2d 381, 137 USPQ 43, 50 (CCPA 1963). Thus, the fact that the claimed non-aqueous compositions are able to produce the unexpected, herein before described results in cleaning aluminum-containing substrates provides nonobvious and patentable status to the claimed compositions and the USPTO dismissal of those arguments is clearly erroneous since such properties must be considered in determining the patentability of the claimed compositions. The PTO has not addressed this principle of patent law as highlighted above and detailed in the Papesh decision that the properties of a composition are an inherent part of the claimed composition and must be addressed in assessing the patentability of a composition. The PTO instead has simply ignored this principle and given no consideration to the unobvious properties of Applicant's claimed composition. To do so is clearly erroneous on the part of the PTO. When those properties of Applicant's claimed composition are considered the unobviousness of the claimed composition over the prior art is readily apparent.

Applicant again points out that the disclosure in Koito et al. clearly shows that the low amounts of water in the Koito et al compositions demonstrate that, in their use setting, the presence of low amounts of water results in unacceptable results. **Every specific composition disclosed in the examples in Koito et al. contains water. There is no disclosure of any composition without water.** Moreover, even more pertinent is the fact that the specific compositions illustrated in Koito et al. clearly show that when there is

**little water in their compositions the compositions do not provide suitable strippability.** See Table 1, agent # 5 and table 2, agents # 12 and # 13 containing 4% water. Their strippability is an unacceptable "C". i.e., "damage observed". See also Table 8, agent # 24 with only 1% water, where film damage is rated "D", i.e., "damage was significant". Thus, for this reason, the Koito et al. disclosure cannot teach a **non-aqueous composition, and particularly a non-aqueous composition meeting all the other parameters and requirements of Applicant's claims.** The PTO attempts to refute this specific showing in Koito et al. by contending that "...the Examiner maintains that the damage which occurred to substrates as shown in the examples of Koito et al was not attributed to the amount of water used but to various mixtures of different alkanolamines and corrosion inhibitors." This contention is clearly erroneous. Table 1 of Kioto et al. clearly demonstrates that it is the water that causes the unacceptable result since examples 1-9 in that Table all contain the same components and the amount of water changes and therefore the examples are directly comparable. Thus, it is clearly demonstrated that it is the lack of sufficient water that Koito et al. shows to be detrimental. The PTO's contention attempts to compare apples with oranges, i.e. compositions of different components which are not directly comparable and from which no conclusion about the effect of water can be drawn. Thus, Applicant's position is clearly supported by the data results in Koito et al. and the PTO's position is unsupported and totally erroneous. The Office Action fails to show how the data in Table 1 of Koito et al. wouldn't support the conclusion that low amount of water in the Koito et al compositions is detrimental. Therefore, it is clear that applicant's non-aqueous compositions are unobvious and patentable.

Therefore, in view of the foregoing, the USPTO is respectfully requested to reconsider and withdraw the rejection of claims 1-4, 8-11 and 27 are rejected over Koito et al. (US 2003/0130147) under 35 U.S.C. 103.

The rejection of claims 5, 6,7 and 12 under 35 U.S.C. 103 over Koito et al. (US 2003/0130147) in view of Hara et al. (US 2002/0128164) is likewise respectfully traversed.

The deficiencies of the Koito et al. disclosure, as discussed herein before, are not cured by Hara et al. and this Section 103 rejection of claim 5, 6, 7 and 12 is also erroneous for the same reasons, and its withdrawal is respectfully requested.

Moreover, as stated in Applicant's previous Response, the compositions of Hara et al. are completely different types of compositions than those of Koito et al. and the two teaching are not combinable. The PTO has erroneously dismissed this contention, in the RESPONSE TO ARGUMENTS section of the August 2, 2006 Office Action, on the grounds that Koito et al. and Hara et al. are in "the same general field of endeavor and are used for cleaning and/or stripping semiconductor substrates". This completely overlooks and erroneously dismisses the fact that in the field of microelectronic strippers **not all microelectronic stripping compositions operate the same way** and those that operate by different mechanisms prevent their teachings from being combined (combined out of context as is attempted to be done by the PTO in formulating this rejection). The compositions disclosed in the Hara et al. document are not only highly aqueous, but even more significantly are an entirely different type of compositions than the type of compositions of Koito et al. and also of the present invention. The compositions of Hara et al. are **aqueous compositions that must contain a peroxide oxidizing agent and a quaternary ammonium salt**, neither of which is employed in Applicant's **non-aqueous** compositions. The peroxide-containing (oxidizer-containing) compositions of Hara et al are compositions that **have a cleaning mechanism (oxidization) that is completely different from the compositions of Koito et al.** and also from the compositions of Applicant's invention and thus operate via a different cleaning mechanism. Therefore, any teaching of equivalency of components in the differently operating compositions of Hara et al. cannot be extrapolated to any kind of equivalency in a completely different composition of Koito et al. or for that matter in the different compositions of the present claims, that have a completely different cleaning mechanism because of the different type of compositions involved. **The PTO has not answered this factual reality that the two references are for compositions acting in completely different manners and thus their teachings are not combinable for this very reason.**

Since the cleaning mechanisms of Hara et al. and Koito et al. operate by different cleaning mechanisms, there is no basis for the conclusion of the PTO that equivalency of components in Hara et al. would lead one skilled in the art to expect those components to operate equivalently in a composition that operates by a totally different cleaning mechanism, as was explained here before. Thus, the reliance on Hara et al. to show some alleged equivalency is clearly erroneous, making the rejection of Applicant's claims erroneous, and the PTO is respectfully requested to reconsider and withdraw the rejection of claims 5, 6 7 and 12 under Section 103 over Koito et al. in view of Hara et al.

Furthermore, Hara et al. fail to disclose that the cleaning compositions **must** contain a nucleophilic amine, a moderate to weak acid having a strength expressed as a "pKa" for the dissociation constant in aqueous solution of from about 1.2 to about 8, a compound selected from the group consisting of an aliphatic alcohol, diol, polyol or glycol ether, and an organic co-solvent, and the weak acid component (b) must be present in the composition in an amount such that the equivalent mole ratio of acid/amine is greater than .75 and that the composition has a pH of from about 4.5 to 9.5. No such composition is disclosed, taught or even remotely suggested by the disclosure in Hara et al.

Hara et al. only optionally has an amine component. The acid component in Hara et al. is also optional and only as a corrosion inhibitor, not as a neutralizer for a nucleophilic amine component. Nothing in Hara et al teaches that both these "optional" components must both be present and that a moderate to weak acid of pKa of about 1.2 to about 1.8 must be employed when a nucleophilic amine is employed and that the acid must be present in the composition in an amount such that the equivalent ration of acid/amine is greater than 0.75 and that the composition has a pH of from about 4.5 to 9.5.

Furthermore, when one looks at what Hara et al. actually disclose, the differences from the present invention become even more apparent. Every example of a composition of Hara et al. is an **aqueous composition having a very significant amount of water**. In Table 1 the amount of water in the compositions ranges from 60 to 90%, in Table 2 the

amount of water ranges from 25 to 90%; and in Table 3 the water ranges from 55 to 90 %. In contrast, Applicant's claimed compositions are non-aqueous compositions. Because of the different way the oxidizing composition of Hara et al. go about cleaning microelectronic substrates nothing in Hara et al. teaches one to eliminate the water and provide a non-aqueous composition, nor to eliminate the absolutely critical peroxide or quaternary ammonium salt components of Hara et al.

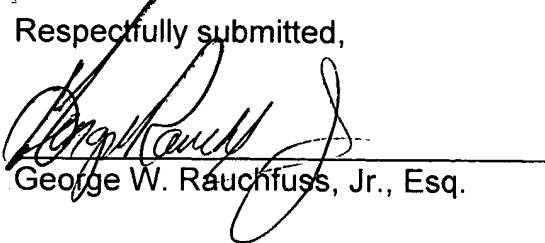
Additionally, the third previous (August 25, 2005) Office Action, in the paragraph bridging pages 4 and 5 of that Action, the PTO recognized and correctly stated that that Hara et al. does not "teach a composition containing the specific amount of acid (corrosion inhibitor) or teach, with sufficient specificity a composition having a specific pH containing a nucleophilic amine, a moderate to weak acid, a glycol ether, a cosolvent, and the other requisite components of the compositions in the specific proportions as recited by the instant claims." It might also be added that Hara et al. fails to require a non-aqueous composition, and in fact, teaches away from such a composition.

Therefore, the USPTO is respectfully requested to reconsider and withdraw the rejection of claims 5, 6, 7 and 12 under 35 U.S.C. 103 over Koito et al. (US 2003/0130147) in view of Hara et al. (US 2002/0128164) for these additional reasons.

After withdrawal of these rejections Applicant request rejoinder of claims 13 to 26 and 28 with claims 1 to 12 and 27, per *In re Ochiai*, 71 F. 3d 1565, 37 USPQ2d 1127 (Fed. Cir. 1995).

It is respectfully submitted that the foregoing is a full and complete response to the Office Action and that all the claims are allowable for at least the reasons indicated. An early indication of their allowability by issuance of a Notice of Allowance is earnestly solicited.

Respectfully submitted,



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Date: September 28, 2006

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